

INTEGRATION SCHEME FOR ENHANCING CAPACITANCE OF TRENCH CAPACITORS

Abstract

The capacitance of deep trench capacitors is enhanced by increasing the surface area of the doped region of the trench to be used for one electrode of the capacitor. After formation of the deep trench and a collar on an upper region of the trench, and after optional bottling of the trench, hemispherical silicon grain (HSG) is deposited on a lower region of the trench. The HSG is then oxidized, along with that portion of the silicon substrate not covered by HSG, to form a roughened surface in the trench, thereby enhancing the trench capacitance. Oxidation of the HSG and the substrate occurs simultaneously with formation of the buried plate, and the formed oxide may be stripped along with the collar, thereby providing a simpler and more robust capacitance enhancement scheme.